Brazil

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To further inform policymakers on the future impacts of climate scenarios on child health, we estimated the impacts of two climate scenarios on all-cause under-5 mortality in the five largest municipalities of the 26 Brazilian States and in Brasília - totalling 131 Brazilian municipalities. We accessed detailed historical census data, official population and mortality projections to estimate heat-related all-cause mortality among children under-5 in Brazil in a 20-year period from 2040 to 2059 under two scenarios of intermediate and high-CO2 emissions (See Box 1):

• SSP245: Intermediate-emission scenario with stable emissions until 2050, with a 2.5-3°C warming

• SSP585: High-emission scenario leading to 4-5 °C increase in temperature by the end of the century

BOX 1: Model details for Brazil

- Historical data on temperature includes period between 2010-2029 (baseline).
- Temperature data under Scenarios SSP2-4.5 and SSP5-8.5 are generated by a mean of the 5 global climate models specifically for Brazil (CMCC-ESM2, CMCC-CM2-SR5, MRI-ESM2-0, BCC-CSM2-MR and GISS-E2-1-G).
- Future projections for the population and mortality among children under-5 for 2040 to 2059 was estimated using Brazilian 2010 and 2022 Census, and official projections.
- The relative risks (RR) of under-five mortality associated with a 1°C increase above the 75th percentile of daily mean temperatures — accumulated over a 7-day lag — were estimated for the period between 2000 and 2019. These estimates were calculated for each Brazilian region (North, Northeast, Centre-West, Southeast, and South) using a distributed lag non-linear model (DLNM), following the methodology proposed by Silveira et al. (2025). (see publication).
- Exposure-response functions for the impact of heat on childhood mortality are derived from two models: a linear model and one accounting for regional variation.

According to our projections, childhood mortality rises in Brazil under the two future climate scenarios (2040–2059) compared with historical mortality data (2010–2029) independent of the exposure models we used.

In our models, either using a single RR for Brazil or one model for each of the five Brazilian regions (Regional models), heat-related under-5 mortality in Brazil would increase from 1.07 per 100,000 (baseline) to 1.47 per 100,000 under the ssp245 scenario and to 2.00 per 100,000 under ssp585 – representing 87% more deaths related to heat until 2059 in the high-emission scenario (See Figure 1).

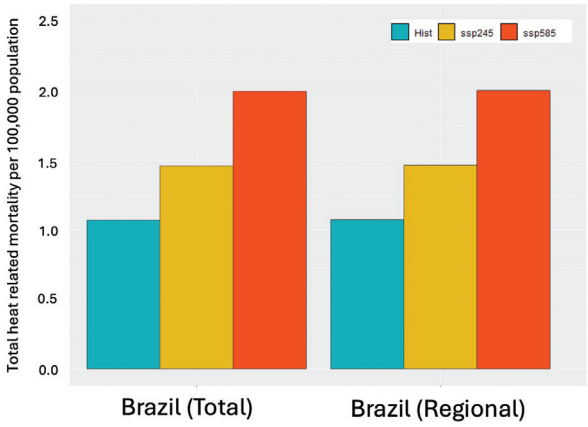

FIGURE 1. *Projected Childhood Heat-Related Mortality in Brazil (2040–2059) compared with historical mortality (2010–2029; shown in blue) under two CO_2 climate scenarios of moderate (yellow) or high (red) emissions.*

When looking at the distribution of heat-related under-5 mortality across Brazilian Municipalities (2040–2059), we see large variations in the average heat-related under-5 mortality per 100,000 population (See Figure 2). All three exposure models show that municipalities are likely to be affected differently by intermediate and high-emission scenarios.

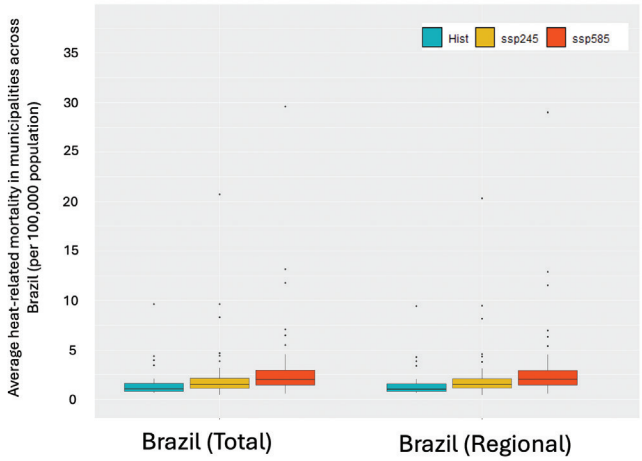

FIGURE 2. *Average heat-related mortality across municipalities in Brazil (per 100,000 population) based on our historical data (blue), and under two climate change scenarios of moderate (yellow) and high-CO2 emissions (red). Box plots show variation of the 131 municipalities.*

Official estimates suggest that the Brazilian population, especially those aged 0-4 years, is decreasing in most municipalities (data not shown here). This has been accompanied by decreasing mortality rates over the years. Despite those estimates, under-5 mortality related to heat in Brazil is expected to increase by up to 50% in moderate-emission scenarios and to almost double in high-emission scenarios.

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